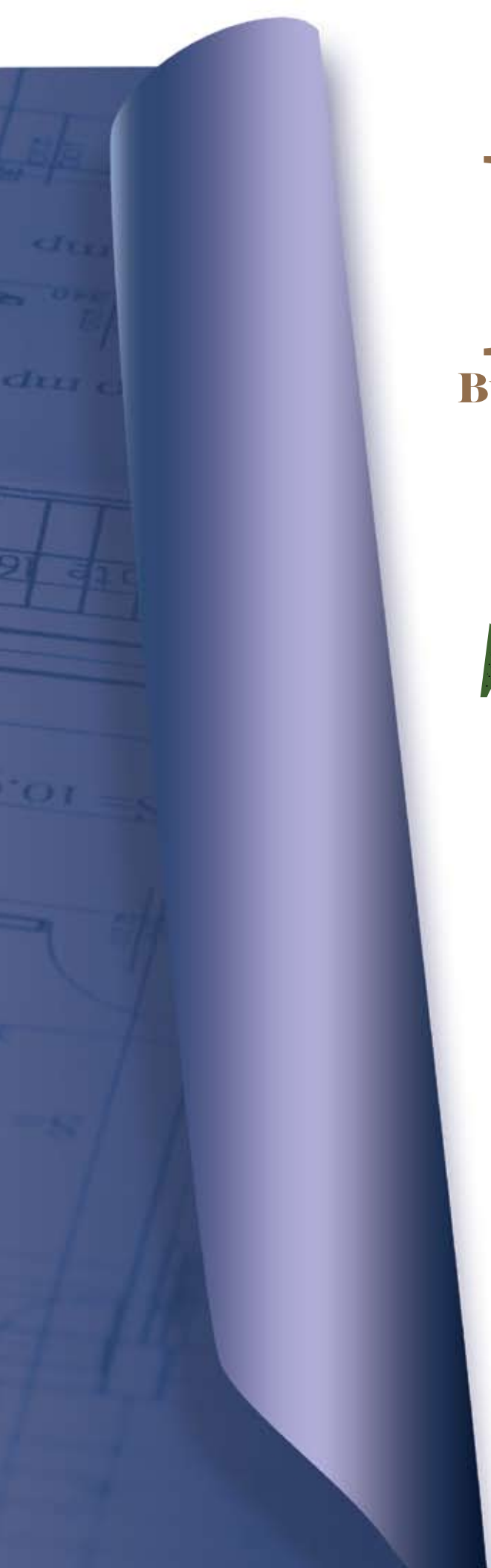


BIM
Building Information Modeling

&

TCO
Total Cost of Ownership

By Douglas K. Christensen, APPA Fellow

There are some words in our industry that seem to be clear and understandable to say, yet they need some help in understanding the depth of the meaning. When the term maintenance is talked about there seems to be some agreement that it does not mean building a new building. Maintenance as a term covers many areas and if not clarified could be interpreted to mean a lot of things. The king of misunderstanding is deferred maintenance. Remember in your own mind what it means to you. Does your definition align with the industry, or is there a bit of an emphasis that is unique to your culture and your interpretation?

Entering into our maintenance vocabulary are some new words. One of the words that seems simple to talk about yet is hard to find a common definition is the term *Sustainability.*

sus · tain'a · bil'i · ty *n.*
is a characteristic of a process or state that can be maintained at a certain level indefinitely

This is one of many definitions that are used to help us understand a new role that seems to becoming the buzzword of the moment. What does this mean to us? In the world of facilities management it is not a new meaning but a new term. We have worried about the "indefinitely" of building and system for years. The thing that seems to be new and what we are adapting to is a process or *state* that can be maintained at a certain level. That seems to be the uniqueness of this definition. We have been working on the "process or state" for a long time. A common definition that includes words such as "maintained" and "level" has a chance on becoming something that is valued in the facilities profession and the educational community. Hopefully this will become a characteristic and mind set of those viewing our built campuses.

Another new word is interoperability. Sometimes referred as a technology term the meaning of the word has a common message that seems simple to understand but difficult to apply.

There are many variations of the definition, but they all point to the concept of **inter – operate**. This is welcome news since many of us are dealing with the silo systems within our organizations. It is a common belief and is getting closer to reality that the network might be our hope for interoperability to happen in a way that it is without special effort on the part of the customer.

in · ter · op · er · a · bil · i · ty *n.*
is the ability of a system or a product to work with other systems or products without special effort on the part of the customer. Interoperability becomes a quality of increasing importance for information technology products as the concept that "The network is the computer" becomes a reality. For this reason, the term is widely used in product marketing descriptions.

Sustainability and interoperability are terms and definitions that help describe two additional terms that are impacting our profession.

- **BIM** – *Building Information Modeling* and
- **TCO** – *Total Cost of Ownership*

The only way these two terms are made feasible is if the practice of sustainability and interoperability is not just a planted idea in the minds of an organization, but that steps are being taken to incorporate the terms into the core way in which management sees its role and vision as facilities managers. These terms if taken on by any organization must realize this is a new vision of their mission. This vision must be understood as a "paradigm shift" and that everything that is currently being done needs to be seen through the new vision.

"WHEN A PARADIGM SHIFTS, EVERYTHING GOES BACK TO ZERO"

These definitions are not correcting steps to where they want to go. These definitions and practices are a new vision of the future and will need to be carefully defined in each organization. The culture of doing business will change. New methods and procedures of doing business will be defined. Traditional roles will be challenged. Welcome to the future.

The challenge with this change is that everyone touching facilities management will be impacted. This is not a higher education shift but

an industry shift. We have the potential of making a better future for education and for our profession. Taking advantage of this opportunity will be the challenge.

BIM *[Building Information Model]* is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle from inception onward.

BUILDING INFORMATION MODELING

BIM, or should I say the adopting of the BIM concepts and processes, can have a positive impact on how we do our business in the future. The BIM by definition will change the way we look and do our business.

Technology is making the BIM definition a reality. The digital representation makes the data accessible and available. The use of 3D helps to visualize what has been at times hard to read and understand from a one dimensional set of flat plans. Having a common place to store in one place all data, information, knowledge, and understanding of a building or an asset provides a reference library unique to that investment. This library will provide a wealth of reliable data and information that will assist in the life-cycle decision making for that building or its systems.

Gathering and storing operating data and comparing the building data to itself and to other similar buildings or systems will allow the organization to learn and know what kinds of systems work best in that environment. How and where to duplicate this success in managing assets will help the planning, design, and construction process and produce a better maintainable product. BIM has a wonderful future for those willing to share its vision.

As a result of the research completed by CFaR, APPA's Center for Facilities Research, in a research monograph called *Buildings…The Gifts that Keep on Taking: A Framework for Integrated Decision Making*, a full thesis was devoted to the study and practice of total cost of ownership. The industry gave insight as to what the components of TCO are and gave many success stories around each of the major cost types that define TCO. The success of the research defined a way to put all three costs together so that a framework could be developed that would bring the three separate silos types together so leadership and resource providers could make better decisions.

The research showed that many owners were getting away from managing and investing in the total investment—the three major cost silos—and instead had focused primarily on just O&M costs. Focusing only on the O&M viewpoint was costing owners much more cash flow than needed to own the assets over its life cycle. The research even suggested that if owners would figure what a new building was going to cost them, for the life cycle of a building, there were huge advantages having cash available to meet the needs of the ongoing costs of O&M and recapitalization. The largest saving would result in how much of the total cost of ownership could be in reserves at the beginning life of a building.

HOW DOES BIM RELATE TO TCO IN THE EDUCATION INDUSTRY?

The strongest relationship is that both are built on the principle of managing the life cycle of the building or asset. Both concepts define life cycle the same way. BIM is a process of gathering data and information at the beginning of the project and tracking knowledge and understanding over the life of the investment works hand in hand with TCO. TCO is a process of gathering costs over the life of the investment at each stage of the life cycle. They both divide the kinds of data and the kinds of costs the same way.

Birth & Burial: BIM is designed to gather all of the data and information needed from *all* of the life-cycle players during the development of the project. This includes everyone: the maintenance, space, business, construction, designers, planners, etc., to manage the building for its life cycle.

NOTE: The data needed for Planning, Design, and Construction in BIM (Working Design Group) is classified the same way as the non-recurring cost group in TCO. All of the data in the working design provides all of the detail data needed to track the life-cycle costs of the building such as descriptions of all systems, components, and other assets that will be needed to use the investment. BIM provides a fully defined frontend to the building project. TCO can take advantage of this detail to track ALL of the costs that relate to the life of the building.

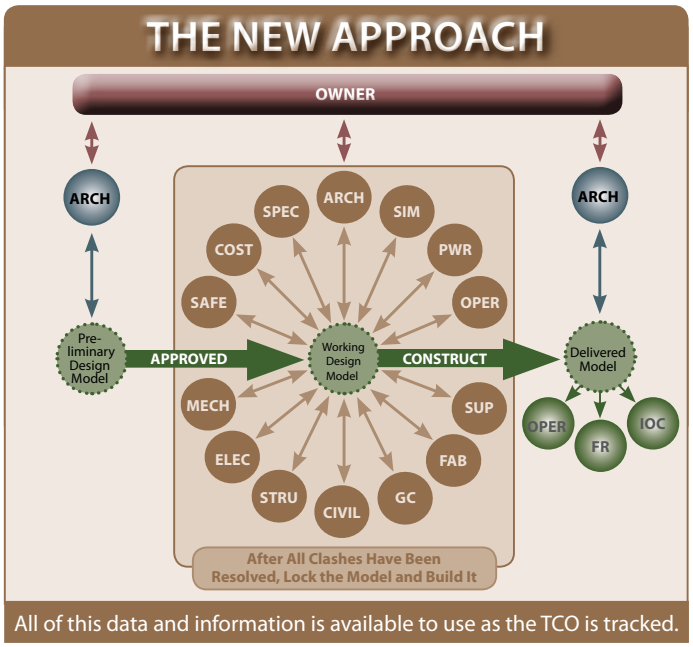
Operations & Maintenance: If BIM is followed as designed then all of

TOTAL COST OF OWNERSHIP
A Holistic View of Asset Management

Birth & Burial *(non-recurring)*	
cost A	Concept to Bid
cost B	Financing
cost C	Construction/Install
cost K	Decommission/Demolition/Disposal
Operations & Maintenance *(annual recurring)*	
cost D	Operations
cost E	Planned Maintenance/Routine
cost F	Repairs/Breakdown
cost G	Utilities
Recapitalization *(periodic recurring)*	
cost H	Retrofits/Improvements
cost I	Programmatic Upgrade
cost J	Replacement/Renewal

the data and information needed to maintain and operate a building is available, even before the construction begins. When a cost is needed the O&M part of the TCO aligns with the data and information already gathered. The future suggests that all of the PMs could be written and available before the project is bid. All maintenance requirements will be known in detail from the completed data and information available. The TCO would track the history of total cost to keep the building maintained and in operation. Over time this would give management a set of data to make more informed decisions.

Recapitalization: The same approach. BIM at the beginning provides all of the data and information needed to do recapitalization life-cycle projections. All of the systems and assets can be inventoried for life cycle management. Resource requirements can be projected and available at the beginning of a building. Recapitalization requires data and costs gathered by the other two TCO cost areas so an evaluation and proper decision can be made on when or if to spend more capital. This cost area allows for the continuation of the investment. The measurement of actual life-cycle costs of systems and assets allows for management to make better decisions about replacement timing of systems.



All of this data and information is available to use as the TCO is tracked.

Which systems are the best for reinvestment/ recapitalization? What can be done to extend the useful life of a building? How does the original purpose of the building need adjustment to meet the current need? All of this added value from data and costs allows management teams the proper data, information, knowledge, and understanding to make the proper decision. This allows investors to get a more favorable return on their investment.

These three different yet needed TCO costs: Birth & Burial, O&M, and recapitalization with the proper upfront planning, design, and construction process of BIM will allow every facilities manager to lead and manage asset at a better level of professionalism.

VISION

As we continue to learn and hear about new words and terms such as sustainability, interoperability, building information model, and total cost of ownership, we hope this discussion helps each of us realize that part our stewardship responsibility is to align with best practice and, even more challenging, to be willing to change when needed.

These four terms all fit our day, fit our future, and fit together. May we learn about each and apply them

where needed. Management support and decision-making data should be collected continuously throughout the life cycle of any asset so proper decisions can be made, but data should only be created once. The data should be managed uniformly in a standard framework and the data should be securely available 24/7. As TCO is gathered over the life of the building there are patterns of cost that show up. These patterns and experience with the building allows knowledge and understanding to happen.

We need to start learning what the TCO of building is like. We need to move to the decision-making power of knowing the TCO of assets. What investment levels do we really need to have? What can we save over the life of an asset? How can we reduce the TCO of a building? What mistakes can we correct? What can we learn? What have we learned? How can we best provide it? We sometimes say that buildings have their own personalities. How do you capture this experience so the future buildings are sustainable, better, and reduce the overall cost of ownership and continue to match our values and vision?

The life-cycle perspective as you use BIM and TCO together, interoperable, is one tool that will get results. This vision will inspire and change the organization for the better as we challenge ourselves and our team to move down the road and improve our business.

Vision: Making it Happen

When it comes to the future,
There are three kinds of people:
Those who let it happen,
Those who make it happen,
And those who wonder what happened.

— John M. Richardson Jr. —

Doug Christensen is director, facility solutions and compliance, at Brigham Young University, Provo, UT, and a Past APPA President. He can be reached at *doug_christensen@byu.edu*.